

CLAIMS

Therefore, at least the following is claimed:

- 1 1. A method of cleaning a substrate, comprising:
 - 2 exposing at least a portion of the substrate to a gas-expanded liquid;
 - 3 and
 - 4 removing a photoresist layer from the exposed portion of the substrate.
- 1 2. The method of claim 1, wherein the gas-expanded liquid includes a gas and a liquid.
- 1 3. The method of claim 2, wherein the gas includes carbon dioxide.
- 1 4. The method of claim 2, wherein the liquid is selected from alcohols, ketones, organic acids, alkanes, and alkenes.
- 1 5. The method of claim 2, further comprising:
 - 2 moving the substrate into a container in a cleaning apparatus, wherein
 - 3 the container includes the liquid; and
 - 4 increasing the pressure of the gas in the cleaning apparatus to produce
 - 5 the gas-expanded liquid.
- 1 6. The method of claim 5, wherein the gas is carbon dioxide and the liquid is an alcohol.

- 1 7. The method of claim 2, further comprising:
 - 2 submerging the substrate in the gas-expanded liquid.
- 1 8. The method of claim 7, further comprising:
 - 2 introducing the gas-expanded liquid into a container; and
 - 3 moving the substrate into the container so that the substrate is
 - 4 substantially submerged in the gas-expanded liquid.
- 1 9. The method of claim 8, wherein the gas is carbon dioxide and the liquid is
2 ethanol.
- 1 10. The method of claim 2, further comprising:
 - 2 flowing the gas-expanded liquid onto the substrate.
- 1 11. The method of claim 10, further comprising:
 - 2 disposing at least one flow nozzle substantially above the substrate;
 - 3 and
 - 4 flowing the gas-expanded liquid through the nozzle, wherein the gas-
 - 5 expanded liquid contacts the substrate.
- 1 12. The method of claim 11, wherein the gas is carbon dioxide and the liquid is n-
2 methyl pyrrolidone.

1 13. The method of claim 2, further comprising:
2 spraying the gas-expanded liquid onto the substrate.

1 14. The method of claim 13, further comprising:
2 disposing the substrate adjacent to at least one spray nozzle; and
3 spraying the gas-expanded liquid through the spray nozzle onto the
4 substrate.

1 15. The method of claim 14, wherein the gas is carbon dioxide.

1 16. A photoresist cleaning system, comprising:
2 a gas-expanded liquid system comprising a gas and a liquid, wherein
3 the gas-expanded liquid system is adapted to generate a gas-expanded liquid;
4 and
5 a substrate handling system adapted to position a substrate so that the
6 gas-expanded liquid contacts the substrate to remove a photoresist layer from
7 the substrate.

1 17. The photoresist cleaning system of claim 16, further comprising:
2 a computer control system configured to control the gas-expanded
3 liquid system and the substrate handling system.

1 18. The photoresist cleaning system of claim 16, wherein the gas-expanded liquid
2 system includes a container to hold the gas-expanded liquid and wherein the
3 substrate handling system is adapted to position the substrate within the
4 container.

1 19. A substrate cleaned by the following method, comprising:
2 exposing at least a portion of the substrate to a gas-expanded liquid;
3 and
4 removing a photoresist layer from the exposed portion of the substrate.